



Northern States Power Company

Prairie Island Nuclear Generating Plant

1717 Wakonade Dr. East
Welch, Minnesota 55089

December 9, 1998

10 CFR Part 50
Section 50.73

U S Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

PRAIRIE ISLAND NUCLEAR GENERATING PLANT

Docket No. 50-306 License No. DPR-60

LER 2-98-5

Turbine Trip/Reactor Trip from 22% Power during Planned Shutdown Operation

The Licensee Event Report for this occurrence is attached. In the report, we made no NRC commitments. This event was reported via the Emergency Notification System in accordance with 10CFR50.72 on November 9, 1998. Please contact us if you require additional information related to this event.

Joel P. Sorensen
Plant Manager
Prairie Island Nuclear Generating Plant

c: Regional Administrator - Region III, NRC
NRR Project Manager, NRC
Senior Resident Inspector, NRC
Kris Sanda, State of Minnesota

Attachment

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LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Prairie Island Nuclear Generating Plant Unit 2	05000 306	98	-- 05 --	00	2 OF 4

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

EVENT DESCRIPTION

On November 9, 1998, Unit 2 was undergoing an orderly shutdown in preparation for refueling. During the course of the shutdown, at approximately 0048, the unit unexpectedly tripped from 22% power. The first-out annunciator was 'Turbine Trip-Reactor Trip', indicating that the reactor trip was caused by a turbine¹ trip. Review of the Sequence of Events report from the plant process computer (ERCS) and review of the plant parameters validated that the cause of the reactor trip was a turbine trip. Integrated plant response to the trip was normal. Operator response to the trip was timely, appropriate, and in accordance with procedures.

CAUSE OF THE EVENT

Cause of the event was a turbine trip. Extensive testing was done to determine the most likely cause of the turbine trip.

Nuclear Steam Supply System devices that provide input to the reactor protection system also provide individual input to the first-out annunciator and to ERCS sequence of events (SOE) program. However, a number of devices that provide input to the turbine trip system do not provide input to any first-out annunciator or SOE program. Also, most of the instrumentation measuring parameters relating to these turbine trip devices do not provide input to ERCS. The cause of the turbine trip has not directly been identified. Review of available plant parameter data and interviews with operators revealed no abnormal trends or values before or after the trip. The immediate integrated plant response from this trip as detailed on the SOE, showed that the turbine stop valves reached the fully closed position before the turbine control valves were fully closed. For most trips, the control valves close slightly before the stop valves. A number of SOEs from past trips were reviewed for detailed comparison. An explanation for the SOEs as it relates to turbine valves is the configuration of the turbine trip systems – the Auto-stop oil system, the turbine stop valve and turbine control valve emergency trip headers – and the diverse ways in which the turbine trip input devices depressurize these fluid systems. Data obtained during testing on the recent startup of Unit 1 supports this explanation.

All possible causes of a turbine trip were systematically evaluated. A test was performed while Unit 2 was being prepared for cooldown for the planned refueling outage. This test latched the turbine to determine if any trip signals remained in effect. While the turbine was latched, various cables, terminal boxes and trip devices were mechanically agitated to determine if a trip signal would result. The test verified that no turbine trip signal still existed at the time of the test and the mechanical agitation did not produce a turbine trip.

¹ EIIIS Component Identifier: TRB

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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

CONCLUSIONS

Based on the SOE of this turbine trip, and the results above, it is concluded that this trip:

- did not originate from any device on the turbine pedestal, which are:
 - Mechanical overspeed trip
 - Condenser vacuum trip
 - Thrust bearing trip
 - Low bearing oil pressure trip
 - Manual trip
- did not originate from any device that inputs to 20AST-1 and 20AST-2 (Auto-Stop Oil Emergency Trip Drain Valves). These are inputs from:
 - AMSAC
 - E-H overspeed
 - Manual control board pushbutton
 - Generator lock-out
 - main/aux transformer lock-out
 - 22 steam generator hi hi level or safety injection, train A
 - 21 steam generator hi hi level or safety injection, train A
 - 22 MSIV closed
 - 21 MSIV closed
 - Reactor trip, train A
 - Both main feedwater pumps tripped
- did not originate from any device that inputs to 20-1 OPC and 20-2 OPC (Control Valve Emergency Trip Fluid Drain Valves). These are inputs from:
 - E-H Overspeed (not a turbine trip signal)
 - 22 steam generator hi hi level or safety injection, train B
 - 21 steam generator hi hi level or safety injection, train B
 - Reactor trip, train B
- did not originate from any device that inputs to 20ET (Stop Valve Emergency Trip Fluid Drain Valve) and 20AST-1 and 20AST-2. These are inputs from:
 - 22 MSIV closed
 - 21 MSIV closed
 - Both main feedwater pumps tripped
 - Generator lock-out
 - main/aux transformer lock-out

This leaves the following as possible sources of the trip:

Hi Hi Level in Feedwater Heater 21A, 21B, 22A, 22B, 23A, or 23B

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The level control system instrumentation and valves for the low pressure feedwater heaters² listed above were checked for calibration and proper operation. All setpoints were found to be in tolerance and the instrumentation in good condition. One dump valve was found to be initially stuck due to a bad solenoid valve, but no high level alarms were received from the associated feedwater heater to indicate that it was the cause of the turbine trip. One control valve was found to stick slightly but was still functional.

It is concluded that a hi hi level trip from one of the low pressure feedwater heaters is the most likely cause of the turbine trip.

ANALYSIS OF THE EVENT

This event is reportable under 10CFR50.73(a)(2)(iv) as an unplanned actuation of the reactor protection system. The health and safety of the public were unaffected since the plant systems responded as designed to the automatic trip.

CORRECTIVE ACTION

The feedwater heater drain level control system was thoroughly inspected and calibrated. Degraded dump and control valves were reworked and functionally tested.

Corrective action for this trip is not required; however, a project has been initiated to add turbine trip inputs to ERCS. Specifically, the modification will bring the 6 low pressure feedwater heater hi-hi level turbine trips and solenoid trip valves 20AST-1, 20AST-2 and 20ET signals into ERCS. The current schedule is to complete the project for Unit 2 before its return to power following the current refueling outage and to complete the project for Unit 1 during its next refueling outage.

FAILED COMPONENT IDENTIFICATION

None.

PREVIOUS SIMILAR EVENTS

Turbine trips have been experienced on both units. The cause of previous trips has generally been known.

² EIIIS Component Identifier: HX

CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

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HUNSTAD,A. Northern States Power Co.
SORENSEN,J.P. Northern States Power Co.
RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 98-005-00:on 981109,RT from 22% power during planned SD
operation was noted.Caused by TT.FW heater drain level
control was thoroughly inspected & calibrated.With 981209
ltr.

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